A PRELIMINARY NOTE ON THE PREVALENCE OF MOSQUITOES IN CAIRO AND ITS ENVIRONS

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The Nile Floods of 1908 and 1909 were exceptionally high as compared with those of the previous three years. In 1908 the maximum level reached at Rhoda Bridge was 19·82 metres; this year (1909) the level was slightly less, viz., 19·69 metres. The average maximum heights for the years ending 1905-1907 was about 18·20 metres.

One of the results of such high Niles during the past two seasons has been to flood, by infiltration through the soil, the low-lying parts of Cairo and its environs. In many of these collections of infiltration water, mosquitoes breed in large numbers; the species varying to some extent with the kind of breeding-place. Fortunately, in the majority of cases the infiltration breeding-places are but temporary, persisting from two to three months only.

The breeding-places of this nature in Cairo and its environs are as follows:-

I. Cairo.

- A. Flooded building-sites — excavated. / unexcavated.
- B. Flooded basements of buildings (cellars)*
- C. Flooded gardens.
- D. Disused sakia pits (water-wheel pits) in gardens.

II. Environs of Cairo.

- E. Borrow-pits alongside roadway and railway embankments.
- F. Flooded garden and agricultural land.
- G. Sakia pits—not in use.

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*Observation by Dr. E. H. Ross, Public Health Department.

Disused 'sakia' or water-wheel pits are permanent breeding-places, but when the water level in them is raised to near the surface of the land by infiltration from the Nile, it is possible that the species of mosquitoes breeding in them may differ, since the water will be more exposed to light.

In addition to the breeding places mentioned above, there are the cesspits, which supply Cairo with an unfailing supply of *Culex fatigans*, Wied., throughout the year, their numbers varying with the season (temperature). It is probable, however, that many old or little-used cesspits and wells, which at other times of the year are dry, become converted into breeding-places for Culicids during the flood.

In the case of gardens, agricultural land, and borrow-pits, flooded by infiltration from the river, one finds almost invariably that the surface of the water is overgrown with grass, water-plants and algae (*Spirogyra*, sp., *Hydrodictyon*, sp.). These places then form admirable breeding-sites for Anopheline as well as Culicine larvae. By about the middle of October, 1908, and again in 1909, collections of water of this nature were swarming with Culicine larvae and to a lesser degree with the larvae of *Cellia pharoensis*, Theob.

Such was the state of affairs on the Island of Ghezireh in October and November, 1908-1909. Ghezireh is situated opposite Cairo, and is connected with both banks of the river by bridges. On the island there is a large resident European population with their native and European servants; there are, in addition, a considerable number of native and European workmen, who go to and from their daily work. Again there is what may be described as a floating riverside population (chiefly natives) living in house-boats ('dahabiehs') moored against the banks, and in the ordinary Nile-boats engaged in the transport of merchandise.

As many parts of the island are low-lying they suffered considerably from flooding by infiltration from the river. *Culex*, spp. bred in countless numbers, and *Cellia pharoensis* in 'thousands.' *Grabhamia willcocksii*, Theob., was also very numerous. The females of this last species are vicious blood-suckers as well as plant feeders, but they do not appear to enter houses in any numbers.

Although *Cellia pharoensis*—a supposed malaria carrier—was very abundant in the autumn of 1908 in Ghezireh, yet, so far as the writer is aware, there were no cases of malaria reported amongst the inhabitants, although the latter are derived from many parts of Egypt, and include also Europeans from India, the Southern Sudan, etc.

One might reasonably expect, therefore, that some cases of malaria would occur among such a population, and that in the presence of abundance of supposed carriers (*C. pharoensis*) an outbreak of malaria would occur, but this was not so.*

One result of the collecting work carried out during the past two autumn seasons (1908-1909), has shown *Cellia pharoensis* to be an extremely common Anopheline in the environs of Cairo (it is believed to be the common Anopheline of Egypt). The apparent rarity, however, of malaria in this country, according to medical men, has raised doubts in the writer's mind as to the exact rôle played by *Cellia pharoensis* as a malaria carrier. Is this species a bad carrier, or a carrier at all?; or is the malaria carrier of Egypt some other much less common species of Anopheline which has so far been overlooked? Other Anophelines are also found in Egypt.

With regard to the question of the apparent rarity of malaria in the environs of Cairo one fact must not be lost sight of, namely, that the mosquito invasion takes place late in the year, and lasts a short time only—two or three months—and, moreover, does not, so far as is known, occur every year, but would appear to be dependent on the height of the Nile flood. It is possible that this has some bearing on the problem.

The habits of *Cellia pharoensis* are of interest. This species may be classed as a 'domestic mosquito' both in the larval and adult stages, but at present it is not known how far away from human habitations *Cellia* will breed. The adults enter houses in order to obtain blood. In the open the females appear to bite most viciously at sunset; their bite being rather painful compared with that of the common Culicine, *Culex fatigans*.

The aerial dances performed by male mosquitoes at sunset are perhaps worthy of note. The males of *Culex*, spp. dance in columnar form, well in the open, or in some cases, near or above bushes, and from fifteen to twenty feet from the ground. Thousands of individuals may be present in one of these dances, all in extremely rapid movements of limited range. They produce a very audible hum. The males of *Cellia pharoensis* dance as a rule in the open, but much nearer to the ground than *Culex*, nor do they collect together in such large numbers. Their flight is also much slower. The aerial dances of the males of *Grabhamia willcocksii* are again different. They appear almost invariably to take place close to bushes, under trees or sheds; the males fly backwards and forwards with a slow and easy flight, about three feet from the ground, columns not being formed. One rather striking fact concerning these aerial dances is the comparatively small numbers of females which join them in order to pair with the males.

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*In November, 1909, however, one solitary case of malaria occurred in a cowman employed in the grounds of the Khedevial Agricultural Society.

The mosquito conditions on the Gizeh side (west bank) of the Nile were the same as those which prevailed on Ghezireh both in 1908 and 1909. *Cellia pharoensis*, *Grabhamia willcocksii* and *Culex*, spp. were found in numbers, breeding in borrow-pits, flooded building-land, gardens and agricultural land. Many of these breeding places were located close to native villages, or to houses occupied by both Europeans and natives.

With regard to the City of Cairo, which is situated on the east bank of the river, one expected to find Culicids breeding in large numbers, but it was somewhat of a surprise, to find *C. pharoensis* breeding in the heart of a thickly populated native quarter of the city. At the end of November, 1908, a number of larvae were taken in a disused pit (water-level about 3 feet from the surface, and well lighted) in a garden in the Boulac district of Cairo. In November of this year (1909), this species was again found in the same garden, not in the sakia pit, but in a small pool of infiltration water.

On two occasions the writer has caught adult *Cellia pharoensis* in the Turf Club, Cairo. This building is situated too far away to be invaded by *Anophelines* from any of their known breeding places; the inference is therefore, that *Cellia* breed in other parts of Cairo.

In November of this year the writer obtained several records of the occurrence of *Cellia* (adults) in Cairo on the authority of Dr. H. E. Ross and others, and recently a new breeding-place was found in the Chubra quarter of Cairo.

Early in December, 1908, a new Anopheline was discovered in Cairo. This mosquito belongs to the genus *Pyretophorus*, and thus falls under suspicion as a possible malaria carrier. In a subsequent paper dealing fully with the mosquitoes found so far in Cairo and district it is proposed to describe this species under the name of *Pyretophorus cleopatrae*.

Breeding-places of this new Anopheline were found in the Gamrah and Chubra quarters of Cairo; also at Demadache, and at Heluan, abount fifteen miles from Cairo. The waters in which the *Pyretophorus* larvae live is brackish, the dissolved sodium chloride varying from 0·366 per cent. to 2·6 per cent., and as a rule few or no grasses or water-plants have been present.

In the same pools the larvae of a new Culicid (n.sp. and ? nov. gen.) have also always been found, but neither of these species has—except on one doubtful occasion—ever been found associated with *Cellia pharoensis,* nor have they yet been found on the west bank of the river.

Larvae of *C. pharoensis,* both young and well-grown, placed in water containing 1·78 per cent. common salt, taken from a breeding-place of the *Pyretophorus* larvae, died in less than twenty-four hours, In water containing 1 per cent. common salt, also from a *Pyretophorus* breeding-place, *Cellia* larvae lived from two to three days, but during this period until death took place they were very sluggish in their movements and appeared to feed very little or not at all, though in each case food was provided for them.

The more distant environs of Cairo visited were Marg and Ezbet el Nakhl to the North, and Toura and Heluan to the South. In both the former places *Cellia pharoensis* was common, also *Culex,* spp. and *Grabhamia willcocksii.*

At Toura, *Cellia pharoensis* breeds in borrow-pits situated in the desert, some close to the railway, others further away. Except in one case neither grass nor reeds grew in these pits, but the surface of the water was overgrown with algae, which provided protection as well as food for the larvae. It is of interest to note that a few years ago, there was an outbreak of malaria amongst the convicts at Toura prison. The prison buildings are within a short distance of the borrow-pits mentioned.

At Heluan, in pools in marshy ground lying immediately to the South-west of the town the larvae of the new *Pyretophorus* were found in large numbers. The water in these pools contained from 2·56 per cent. to 3·25 per cent. of common salt. In a pool to the North of the town the *Pyretophorus* larvae were found associated with the larvae of *Grabhamia willcocksii,* Theobald, and *Theobaldinella spathipalpis,* Rondani. The water in this pool contained 1·6 per cent. common salt. Both the pools to the North and South of the town appear to be fed by springs.

Cellia pharoensis was not found at Heluan.

In previous years, cases of malaria are said to have occurred in Heluan.

During the collecting work carried out in 1908 and 1909, a number of natural enemies of larvae were observed. The most important of these are aquatic bugs (Hemiptera), commonly known as 'back-swimmers' (so named from their habit of swimming on their backs), belonging to the genus *Notonecta*. This genus has a wide geographical distribution, and its members are recorded by observers in other parts of the world as natural checks on the increase of Culicidae. In 1908 a large area of the Ghezireh grounds of the Khedevial Agricultural Society, flooded by infiltration water, was largely freed from larvae of *Culex* spp. and *Cellia pharoensis* through the agency of these aquatic bugs, and the same has been observed in other localities.

These bugs appear to increase rapidly and to become quickly distributed in a district. The adults leave the water with ease and take flight, but if in the course of their flight they hit an obstacle and fall, they appear to have very great difficulty in again taking wing or even to be unable to do so. They leave the water with the dorsal surface upwards making a slight whirring noise.

Another but rather rare member of the same family of water-bugs (*Notonectidae*) has also been found to prey upon mosquito larvae, and although these insects measure but 2 mm. in length they will attack and destroy almost full-grown mosquito larvae.

Other natural enemies noted were water-boatmen (*Corixidae*), aquatic beetles and their larvae, and the larvae and nymphs of dragon-flies (*Libellulidae*).

The 'back-swimmers' of the genus *Notonecta* must undoubtedly be placed at the head of the list. It is unfortunate that these useful insects do not as a rule inhabit quite shallow waters, and also that their mosquito destroying operations are hindered to some extent, by growths of grass water-plants and algae, which protect their prey.

With regard to the enemies of adult mosquitoes, bats appear to catch them at sunset, dragon-flies probably destroy some also, but in any case it is probable that the greater proportion of mosquitoes destroyed in this way are males.